AALBORG UNIVERSITET

# MASTER OF SCIENCE (MSC) IN ENGINEERING (INNOVATIVE COMMUNICATION TECHNOLOGIES AND ENTREPRENEURSHIP) 2018

MASTER OF SCIENCE (MSC) IN ENGINEERING
COPENHAGEN

# Master of Science (MSc) in Engineering (Innovative Communication Technologies and Entrepreneurship) 2018

Link to this studyline

Link(s) to other versions of the same line:

Curriculum for the Master's Programme in Innovative Communication Technologies and Entrepreneurship, 2020
Curriculum for the Master's Programme in Innovative Communication Technologies and Entrepreneurship, 2019

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## § 1: PREFACE

Pursuant to Act 261 of March 18, 2015 on Universities (the University Act) with subsequent changes, the following curriculum is stipulated. The programme also follows the Joint Programme Regulations and the Examination Policies and Procedures for The Faculty of Engineering and Science, The Faculty of Medicine and The Technical Faculty of IT and Design.

## § 2: BASIS IN MINISTERIAL ORDERS

The Master's programme is organised in accordance with the Ministry of Higher Education and Science's Order no. 1328 of November 15, 2016 on Bachelor's and Master's Programmes at Universities (the Ministerial Order of the Study Programmes) and Ministerial Order no. 1062 of June 30, 2016 on University Examinations (the Examination Order). Further reference is made to Ministerial Order no. 111 of January 30, 2017 (the Admission Order) and Ministerial Order no. 114 of February 3, 2015 (the Grading Scale Order) with subsequent changes.

## § 3: CAMPUS

The programme is offered in Copenhagen.

## § 4: FACULTY AFFILIATION

The Master's programme falls under the Technical Faculty of IT and Design, Aalborg University (AAU).

## § 5: STUDY BOARD AFFILIATION

The Master's programme falls under the Board of Studies for Electronics and IT.

## § 6: AFFILIATION TO CORPS OF EXTERNAL EXAMINERS

The Master's programme is associated with the body of external examiners for engineering educations: electro (In Danish: censorkorps for Ingeniøruddannelsernes landsdækkende censorkorps; elektro).

## § 7: ADMISSION REQUIREMENTS

**Applicants with a legal right of admission (retskrav):**

Applicants with the following bachelor's degree are entitled to admission:

- Bachelor of Science (BSc) in Engineering (IT, Communication and New Media), Aalborg University

**Applicants without legal right of admission**

Bachelor's programmes qualifying students for admission:

- Elektronik og IT (AAU)
- Internetteknologier og computersystemer (AAU)
- Softwareteknologi (DTU) (BSc or BEng)
- Netværksteknologi og IT (DTU) (BSc)
- IT-Elektronik (DTU) (BEng)
- IT og økonomi (DTU) (BEng)

All students must document English language qualifications comparable to an 'English B level' in the Danish upper secondary school (minimum grade 02).

## § 8: THE PROGRAMME TITLE IN DANISH AND ENGLISH

The Master's programme entitles the graduate to one of the two designations below depending on the specialisation:

- Civilingeniør, cand. polyt. (candidatus/candidata polytechnices) i innovativ kommunikationsteknik og entrepreneurskab med specialisering i serviceudvikling

The English designation is:

- Master of Science (MSc) in Engineering (Innovative Communication Technologies and Entrepreneurship) with specialisation in Service Development

or

- Civilingeniør, cand. polyt. (candidatus/candidata polytechnices) i innovativ kommunikationsteknik og entrepreneurskab med specialisering i forretningsudvikling

The English designation is:

- Master of Science (MSc) in Engineering (Innovative Communication Technologies and Entrepreneurship) with specialisation in Business Development

## § 9: PROGRAMME SPECIFICATIONS IN ECTS CREDITS

The Master's programme is a 2-year, research-based, full-time study programme. The programme is set to 120 ECTS credits.

## § 10: RULES CONCERNING CREDIT TRANSFER (MERIT), INCLUDING THE POSSIBILITY FOR CHOICE OF MODULES THAT ARE PART OF ANOTHER PROGRAMME AT A UNIVERSITY IN DENMARK OR ABROAD

The Study Board can approve that passed programme elements from other educational programmes at the same level replaces programme elements within this programme (credit transfer).

Furthermore, the Study Board can, upon application, approve that parts of this programme is completed at another university or a further education institution in Denmark or abroad (pre-approval of credit transfer).

The Study Board's decisions regarding credit transfer are based on an academic assessment.

## § 11: EXEMPTIONS

The Study Board's possibilities to grant exemption, including exemption to further examination attempts and special examination conditions, are stated in the Examination Policies and Procedures published at this website: https://www.studieservice.aau.dk/regler-vejledninger

## § 12: RULES FOR EXAMINATIONS

The rules for examinations are stated in the Examination Policies and Procedures published at this website: https://www.studieservice.aau.dk/regler-vejledninger

## § 13: RULES CONCERNING WRITTEN WORK, INCLUDING THE MASTER'S THESIS

In the assessment of all written work, regardless of the language it is written in, weight is also given to the student's formulation and spelling ability, in addition to the academic content. Orthographic and grammatical correctness as well as stylistic proficiency are taken as a basis for the evaluation of language performance. Language performance must always be included as an independent dimension of the total evaluation. However, no examination can be assessed as 'Pass' on the basis of good language performance alone; similarly, an examination normally cannot be assessed as 'Fail' on the basis of poor language performance alone.

The Study Board can grant exemption from this in special cases (e.g., dyslexia or a native language other than Danish).

The Master's Thesis must include an English summary. If the project is written in English, the summary can be in Danish. The summary is included in the evaluation of the project as a whole.

## § 14: REQUIREMENTS REGARDING THE READING OF TEXTS IN A FOREIGN LANGUAGE

It is assumed that the student can read academic texts in his og her native language as well as in English and use reference works etc.

## § 15: COMPETENCE PROFILE ON THE DIPLOMA

The following competence profile will appear on the diploma:

A Candidatus graduate has the following competency profile:

A Candidatus graduate has competencies that have been acquired via a course of study that has taken place in a research environment.

A Candidatus graduate is qualified for employment on the labour market based on his or her academic discipline as well as for further research (PhD programmes). A Candidatus graduate has, compared to a Bachelor, developed his or her academic knowledge and independence so as to be able to apply scientific theory and method on an independent basis within both an academic and a professional context.

## § 16: COMPETENCE PROFILE OF THE PROGRAMME

The programme includes two specialisations:

- Service development (SD)
- Business development (BD)

Depending on the chosen specialisation, the graduate of the Master's programme [1]

| | | SD | BD |
|---|---|---|---|
| **Knowledge** | has knowledge on information and communication technologies (ICT) that, in selected areas, is based on the highest international research | x | x |
| | understands the relevance of the needs of the end users, their use of ICT, and the mechanisms that influence the user experience and the acceptance of new technologies | x | x |
| | understands the importance of innovation, creativity and entrepreneurship for ICT solutions and services | x | x |
| | understands and can reflect, on a scientific basis, on the technical, organisational and market-related drivers in the convergence of ICT, as well as the interplay between technology, market and user issues | x | x |
| | has a holistic understanding of the environment of ICT services and solutions: Scenarios of use, target users, stakeholders, business aspects, and societal implications at largex | x | x |
| | has in-depth knowledge of service enablers, personalisation and the use of context information for enrichment of services | x | |
| | has in-depth knowledge and understanding of principles and technologies related to privacy, trust, and identity and access management | x | |
| | has in-depth knowledge of content and media management, metadata and recommender systems | x | |
| | has knowledge on state-of-the-art network technologies, Internet technologies and service architectures, e.g. Internet of Things, cloud architectures, heterogeneous networks, RESTful architectures, and Application Programming Interfaces (APIs) | x | (x) |
| | has knowledge on ICT standards and standardisation processes, and their significance from a commercialisation and market perspective | (x) | x |
| | has in-depth knowledge and understanding of ICT-related business models and cases | | x |
| | has in-depth knowledge on economic concepts and tools relevant for preparing a market analysis | | x |
| **Skills** | can identify scientific problems within the field of ICT | x | x |

| | | | |
|---|---|---|---|
| | can evaluate and select among scientific theories, methods and tools, and – on a scientific basis – advance new analyses and solutions within applied ICT | x | x |
| | can efficiently communicate research-based knowledge and discuss professional and scientific problems with both peers and non-specialists | x | x |
| | can produce scientific writing: Articles, reports, documentation, etc. | x | x |
| | can apply scientific methods, tools and general skills related to **employment** within the field of ICT | x | x |
| | can identify and select among relevant standards, technologies and methods for development of ICT solutions and services | x | x |
| | can assess the market, ethical and regulatory framework for application of the technologies | (x) | x |
| | can develop innovative services, applications and solutions **at a conceptual level**, which are relevant in a user perspective | x | x |
| | can develop prototypes or demonstrators of viable ICT solutions and service<br>• based on an in-depth analysis of user requirements, technology and market issues,<br>• using state-of-the-art methods, technologies and tools, and<br>• addressing privacy protection and identity management | x | |
| | can develop advanced ICT solutions including one or more of the elements: Handling of digital content rights; acquisition and processing of sensor information (e.g. bios-signals); handling of large amounts of data to extract relevant information; recommender systems; advanced programming tools; resource management; and privacy protection | x | |
| | can assess the implications and business potential of new ICT solutions and services and develop viable business models and strategies | | x |
| | can prepare a business plan with a detailed financial analysis for introducing an ICT solution or service | | x |
| | can assess the role of existing and emerging ICT solutions and services in relation to sustainable development and evaluate the feasibility of sustainable technologies and solutions | | x |
| **Competences** | can manage work and development situations that are complex, unpredictable and require new solutions | x | x |
| | can independently initiate and implement discipline-specific and interdisciplinary cooperation and assume professional responsibility | x | x |
| | can independently take responsibility for own professional development and specialisation | x | x |
| | has competencies in project work and problem based learning in a global/multicultural environment | x | x |
| | can mediate collaboration and information exchange between development- and business-related functions in organisations | x | x |
| | has an in-depth understanding of ICT technologies, enabling creative and innovative solutions and development of these | x | |
| | has competencies in innovation and entrepreneurship that can be used to transform the potentials of new ICT and media technologies into new solutions and services with an engineering approach | x | |
| | can contribute creatively and innovatively to propose and develop new ICT services/solutions respecting and challenging established legal rules and design principles. | x | (x) |
| | has competencies in business development with a holistic perspective, based on a thorough understanding of the interplay between technology, market and users in ICT and media | (x) | x |

| | | | |
|---|---|---|---|
| | has competencies in innovation and entrepreneurship that can be used to formulate strategies exploiting the potentials of new ICT and media technologies with an engineering approach | | x |

1) ”(x)” indicates a less extensive, partial coverage of the learning objective, as compared to ”x”.

2) REST: REpresentational State Transfer, refers to a widely used programming model for the web.

## § 17: STRUCTURE AND CONTENTS OF THE PROGRAMME

The programme is structured in modules and organised as a problem-based study. A module is a programme element or a group of programme elements, which aims to give students a set of professional skills within a fixed time frame specified in ECTS credits, and concluding with one or more examinations within specific exam periods. Examinations are defined in the curriculum.

The programme is based on a combination of academic, problem-oriented and interdisciplinary approaches and organized based on the following work and evaluation methods that combine skills and reflection:

- lectures
- classroom instruction
- project work
- workshops
- exercises (individually and in groups)
- self-study
- teacher feedback
- reflection
- portfolio work

**Problem-based learning and scientific methods**

In order to ensure a common basis for all students, the first semester project includes a mandatory part on project-organised problem-based learning (POPBL) and scientific methods.

## § 18: OVERVIEW OF THE PROGRAMME

The programme includes two specialisations:

- **Service development**
- **Business development**

The first semester is common. During this semester students must choose one of the two specialisations, and depending on the specialisation different sets of courses are mandatory and elective on 2nd and 3rd semester. This gives students the freedom to compose their studies, even though they are obliged to choose one of the specialisations. Semester projects and themes will also depend on the chosen specialisation.

All modules are assessed through individual grading according to the 7-point scale *or* Pass/Fail. All modules are assessed by external examination (external grading) or internal examination (internal grading or by assessment by the supervisor only).

The curriculum contains the following number of elective courses:

- 1st semester: No elective courses
- 2nd semester: 1 course, 5 ECTS
- 3rd semester: 2 courses, 10 ECTS

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The semester structure with an overview of the ECTS credit breakdown for the various semesters by modules is shown in the table. The first semester on “Services and platforms” consists of mandatory courses only, while the following semesters give room for elective courses as shown. Notice, elective courses might not be offered if less than 10 students sign up.

**Service Development:**

| Offered as: 1-professional<br>Specialisation: Service Development | | | | | | |
|---|---|---|---|---|---|---|
| Module name | Course type | ECTS | Applied grading scale | Evaluation method | Assessment method | Language |
| 1 SEMESTER<br>Services and Platforms | | | | | | |
| Services and Platforms | Project | 15 | 7-point grading scale | Internal examination | Oral exam based on a project | English |
| Communication and Broadcast Networks | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| Entrepreneurship, Innovation and Business Models | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| Internet Technologies and Service Architectures | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| 2 SEMESTER<br>Application Development | | | | | | |
| Application Development | Project | 15 | 7-point grading scale | External examination | Oral exam based on a project | English |
| Development of ICT and Media Services | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| Identity and Access Management | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| 2nd Semester Service Development, Elective course (1 course)<br>Choose 1 course | Course | 5 | | | | |
| 3 SEMESTER<br>Advanced ICT Solutions - Option A | | | | | | |
| Advanced ICT Solutions | Project | 15 | 7-point grading scale | Internal examination | Oral exam based on a project | English |
| Content and Media Management | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| 3rd Semester Service Development, Elective courses | Course | 10 | | | | |
| 3 SEMESTER<br>Advanced ICT Solutions - Option B | | | | | | |
| Academic Internship | Project | 25 | Passed/Not Passed | Internal examination | Oral exam based on a project | English |
| Content and Media Management | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| 3-4 SEMESTER<br>Long Master's Thesis - Option C1 | | | | | | |
| Master's Thesis | Project | 45 | 7-point grading scale | External examination | Master's thesis/final project | English |

| | | | | | | |
|---|---|---|---|---|---|---|
| Content and Media Management | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| 3rd Semester Service Development, Elective courses | Course | 10 | | | | |
| 3-4 SEMESTER<br>Long Master's Thesis - Option C2 | | | | | | |
| Master's Thesis | Project | 50 | 7-point grading scale | External examination | Master's thesis/final project | English |
| Content and Media Management | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| 3rd Semester Service Development, Elective courses | Course | 5 | | | | |
| 4 SEMESTER<br>Master's Thesis | | | | | | |
| Master's Thesis | Project | 30 | 7-point grading scale | External examination | Master's thesis/final project | English |

| 2nd Semester Service Development, Elective course (1 course)<br>Choose 1 course | | | | | | |
|---|---|---|---|---|---|---|
| Module name | Course type | ECTS | Applied grading scale | Evaluation Method | Assessment method | Language |
| Green ICT - Sustainable Business Development | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| Managerial Economics | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| Interaction Design | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |

| 3rd Semester Service Development, Elective courses | | | | | | |
|---|---|---|---|---|---|---|
| Module name | Course type | ECTS | Applied grading scale | Evaluation Method | Assessment method | Language |
| Internet Economics and Governance | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| Standardization | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| Cyber Security and Trust | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| Smart Sensor Data Processing | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |

**Business Development:**

| Offered as: 1-professional<br>Specialisation: Business Development | | | | | | |
|---|---|---|---|---|---|---|
| Module name | Course type | ECTS | Applied grading scale | Evaluation method | Assessment method | Language |

| | | | | | | |
|---|---|---|---|---|---|---|
| **1 SEMESTER**<br>Services and Platforms | | | | | | |
| Services and Platforms | Project | 15 | 7-point grading scale | Internal examination | Oral exam based on a project | English |
| Communication and Broadcast Networks | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| Entrepreneurship, Innovation and Business Models | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| Internet Technologies and Service Architectures | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| **2 SEMESTER**<br>Design and Markets | | | | | | |
| Design and Markets | Project | 15 | 7-point grading scale | External examination | Oral exam based on a project | English |
| Green ICT - Sustainable Business Development | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| Managerial Economics | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| 2nd Semester Business Development, Elective course (1 course)<br>Choose 1 course | Course | 5 | | | | |
| **3 SEMESTER**<br>Governance and Strategies - Option A | | | | | | |
| Governance and Strategies | Project | 15 | 7-point grading scale | Internal examination | Oral exam based on a project | English |
| 3rd Semester Business Development, Mandatory courses<br>Choose at least 1 course module | Course | | | | | |
| 3rd Semester Business Development, Elective courses<br>Choose 1 or 2 course modules | Course | | | | | |
| **3 SEMESTER**<br>Governance and Strategies - Option B | | | | | | |
| Academic Internship | Project | 25 | Passed/Not Passed | Internal examination | Oral exam based on a project | English |
| 3rd Semester Business Development, Mandatory courses<br>Choose at least 1 course module | Course | 5 | | | | |
| **3-4 SEMESTER**<br>Long Master's Thesis - Option C1 | | | | | | |
| Master's Thesis | Project | 45 | 7-point grading scale | External examination | Master's thesis/final project | English |
| 3rd Semester Business Development, Mandatory courses<br>Choose at least 1 course module | Course | | | | | |
| 3rd Semester Business Development, Elective courses<br>Choose 1 or 2 course modules | Course | | | | | |
| **3-4 SEMESTER** | | | | | | |

| Long Master's Thesis - Option C2 | | | | | | |
|---|---|---|---|---|---|---|
| Master's Thesis | Project | 50 | 7-point grading scale | External examination | Master's thesis/final project | English |
| 3rd Semester Business Development, Mandatory courses<br>Choose at least 1 course module | Course | | | | | |
| 3rd Semester Business Development, Elective courses<br>Choose 1 or 2 course modules | Course | | | | | |
| **4 SEMESTER**<br>Master's Thesis | | | | | | |
| Master's Thesis | Project | 30 | 7-point grading scale | External examination | Master's thesis/final project | English |

## 2nd Semester Business Development, Elective course (1 course)
Choose 1 course

| Module name | Course type | ECTS | Applied grading scale | Evaluation Method | Assessment method | Language |
|---|---|---|---|---|---|---|
| Development of ICT and Media Services | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| Identity and Access Management | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| Interaction Design | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |

## 3rd Semester Business Development, Mandatory courses
Choose at least 1 course module

| Module name | Course type | ECTS | Applied grading scale | Evaluation Method | Assessment method | Language |
|---|---|---|---|---|---|---|
| Internet Economics and Governance | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| Standardization | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |

## 3rd Semester Business Development, Elective courses
Choose 1 or 2 course modules

| Module name | Course type | ECTS | Applied grading scale | Evaluation Method | Assessment method | Language |
|---|---|---|---|---|---|---|
| Content and Media Management | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| Cyber Security and Trust | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |
| Smart Sensor Data Processing | Course | 5 | 7-point grading scale | Internal examination | Written or oral exam | English |

A specialisation might not be offered if less than 5 students sign up for it.

**Options for 3rd and 4th semester of the programme**

Students may choose between different options for the 3rd and 4th semester:

| | 3rd Semester | 4th Semester |
|---|---|---|
| Option A | A regular semester with 3 courses and a 15 ECTS semester project | 30 ECTS thesis project |
| Option B | Academic internship in Denmark or abroad (25 ECTS) *) + 1 mandatory course listed under option A (5 ECTS) **) | 30 ECTS thesis project |
| Option C | Long thesis project. The following combinations are possible:<br>• Thesis project (45 ECTS) + 1 mandatory course under option A (5 ECTS) + 2 elective courses under option A (2 x 5 ECTS) on the 3rd semester<br>  ◦ Thesis project (50 ECTS) + 1 mandatory course under option A (5 ECTS) + 1 elective course under option A (5 ECTS) on the 3rd semester | |
| Option D | Study abroad (30 ECTS) | 30 ECTS thesis project |

*) The Academic Internship must have a scope that corresponds the ECTS load.

**) Students on the business development specialisation MUST choose between the two mandatory courses under option A.

The master's thesis can be conducted as a long master's thesis. If choosing to do a long master's thesis, it has to include experimental work and has to be approved by the study board. The amount of experimental work must reflect the allotted ECTS-credits.

## § 19: ADDITIONAL INFORMATION

The current version of the curriculum is published on the Board of Studies' website, including more detailed information about the programme.

## § 20: COMMENCEMENT AND TRANSITIONAL RULES

The curriculum is approved by the Dean of the Technical Faculty of IT and Design and enters into force as of September 2018.

Students who wish to complete their studies under the previous curriculum from 2015 must conclude their education by the 2019 at the latest, since examinations under the previous curriculum are not offered after this time.

## § 21: AMENDMENTS TO THE CURRICULUM AND REGULATIONS

Minor aditorial changes have been made in connection with the digitisation of the study curriculum.